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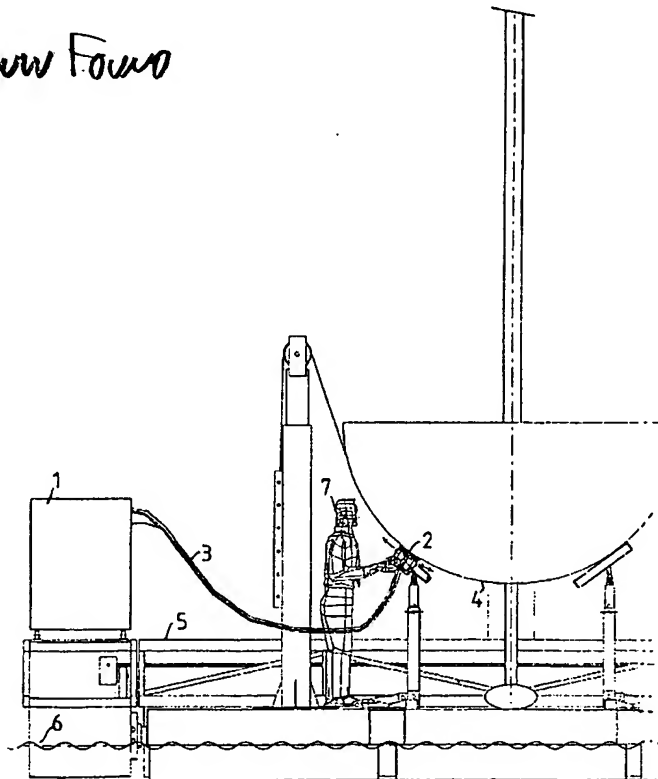
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**(54) System for cleaning a ship side**

(57) The invention relates to a pump unit (1) and a cleaning head (2) connected to the pump unit (1), for cleaning a ship side (4) of a ship which is placed on a wharf or in a dry-dock (5). During cleaning, the cleaning

head (2) is manually moved back and forth along the ship side (4), while the pump unit (1) supplies the cleaning head (2) with a cleaning liquid under high pressure and at the same time drains away cleaning liquid with fouling, removed from the ship side.

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## Description

[0001] The invention relates to a system for cleaning a ship side, comprising a pump unit and a cleaning head, attached to the pump unit, which cleaning head can be moved alongside the ship side.

[0002] A system of this type is known as a high-pressure sprayer and is commonly used for cleaning surfaces in general and for cleaning ship sides in particular.

[0003] A disadvantage of the known system is that the fouling which has been removed in this way will land in the environment in an uncontrolled manner. The system according to the invention substantially obviates this drawback and is characterised in that the pump unit is provided with pump means for pumping a cleaning liquid to the cleaning head and with suction means for returning cleaning liquid from the cleaning head to the pump unit. An additional advantage is that it becomes possible now to add cleaning agents to the cleaning liquid, like detergents, without any burdening of the environment.

[0004] A favourable embodiment of the inventive system is characterised in that the pump unit is provided with filter means for filtering the returned cleaning liquid, as a result of which it can be reused. Moreover, it becomes possible now to dispose of the cleaning liquid and the solid fouling separately in a proper and responsible manner.

[0005] A further favourable embodiment of the invention which is also simple to manufacture is characterised in that the cleaning head comprises a bowl-shaped body, of which an open side is moved alongside the ship side under operational conditions. Preferably, the bowl-shaped body is provided with a number of nozzles, for spraying the cleaning liquid.

[0006] In order to prevent fouling of the ship sides, the ship sides were until recently provided with a so-called anti-fouling layer, which comprises heavy metals. The application of anti-fouling layers of this type is or will be forbidden in most countries. Instead, two new types of layers have been developed which are non-toxic and which slow down the growth of fouling onto the ship sides. The first type of layer is a so-called hard coating, based on synthetic resin, which can be cleaned perfectly with the aid of nozzles. The second type of layer is a so-called soft coating, based on silicone. This layer cannot withstand the direct impact of high-pressure liquid jets as produced by the nozzles. A favourable embodiment of the inventive system is therefore characterised in that the bowl-shaped body is provided with brushes, mounted for rotation, which contact the ship side under operational conditions. In this embodiment, the nozzles must be positioned in such a manner that the liquid jets do not strike the ship side directly.

[0007] A very favourable embodiment according to another aspect of the invention is characterised in that the nozzles are positioned such as to make the brushes rotate under operational conditions. In this way, the liquid jets produced by the nozzles drive the brushes, while

the liquid itself drains away the fouling that has been brushed off.

[0008] A further favourable embodiment of the inventive system is characterised in that an edge of the bowl-shaped body is provided with at least one sensor device, connected to the pump means. The pump means can be switched-off then automatically whenever the bowl-shaped body is not pushed against the ship side, which could result in the loss of cleaning liquid. In addition the sensor device makes the system safer and user-friendlier, as it becomes impossible now to get hit by a powerful jet of cleaning liquid.

[0009] A favourable embodiment which makes the system even more user-friendly is characterised in that a connection between the pump unit and the cleaning head consists of only one hose, through which the cleaning liquid supplied and drained away and through which signals from the sensor device are supplied to the pump unit.

[0010] Another favourable embodiment, which also makes the system more user-friendly, is characterised in that the bowl-shaped body is provided with a grip, which grip is also arranged as a manifold for distributing the cleaning liquid. The grip is preferably made O-shaped and is positioned above the edge of the bowl-shaped body, while in a central position of the O-shaped grip a support for the hose can be placed.

[0011] The invention also relates to a pump unit or a cleaning head, which can be used in a system as described above.

[0012] The invention will now be further explained with a reference to the following figures, in which:

- Fig. 1 represents a possible embodiment of a system according to the invention;
- Fig. 2 represents a possible embodiment of a cleaning head in cross section;
- Fig. 3 represents a possible embodiment of a cleaning head in a longitudinal section;
- Fig. 4 schematically represents a possible embodiment of a pump unit.

[0013] Fig. 1 represents a possible embodiment of a system according to the invention, comprising a pump unit 1 and a cleaning head 2, which are connected by a hose 3. The system is used for removing fouling from a ship side 4 of a hull of a ship. For that purpose, the ship is placed on a wharf in a frame or brought above the water line 6 with the aid of a dry-dock 5, in such a way that the operator 7 can reach the entire hull. For cleaning, the operator 7 moves the cleaning head 2 back and forth over the ship side 4, until he visually concludes that the treated area is clean. Important is, that during cleaning practically no cleaning liquid is released, so that operator 7 can work unprotected.

[0014] Fig. 2 represents a possible embodiment of a cleaning head 2 in cross section, comprising a bowl-shaped body 8, in the inside of which the actual cleaning

operation takes place and onto which a number of nozzles 9a,9b,... are mounted which spout with great power a cleaning liquid, basically water plus a cleaning agent like soap, to the inside. The nozzles are arranged in two rows and the angle, under which they spout the cleaning liquid to the inside can be adjusted, for example by mounting the nozzles onto strips 10a,10b which in turn are mounted slidable onto bowl-shaped body 8. Moreover, bowl-shaped body 8 is provided with two brushes 11a,11b, mounted for rotation, which convert part of the kinetic energy contained in the cleaning liquid into a rotating brushing movement. With the brushes in an extreme position, shown with the aid of nozzle 9a, the cleaning liquid can reach a ship side 12 directly, which is useful if the ship side is covered with a hard coating, while with the nozzles in a position shown with the aid of nozzle 9b, the cleaning liquid cannot reach the ship side directly, which is important if ship side is covered with a relatively vulnerable non-stick layer, for example based on silicone.

[0015] Centrally in bowl-shaped body 8, a suction tube 13 is placed, which ends via an adapter part 14 in a slot 15 which stretches along substantially the entire length of bowl-shaped body 8 and via which the spray, produced by nozzles 9a,9b,... and the fouling which it has released is exhausted. Suction tube 13 is supported by a grip 16, which is also made of plastic tubing and via which the high pressure cleaning liquid is passed to the nozzles. For that purpose, the tubes 17a,17b,..., via which the cleaning liquid is passed to the nozzles 9a, 9b, are connected to grip 16, while grip 16 in turn is connected to pump unit 1 via a tube 18 which is included in a hose 19 which connects cleaning head 2 with pump unit 1. Hose 19, which has a large diameter, is connected to a vacuum pump in pump unit 1 and its main task is to drain away used cleaning liquid and detached fouling. Moreover, two wires 20a,20b pass through hose 19, which are connected in an obvious way to a number of switches 21a,21b,..., which are mounted in the edge of the bowl-shaped body, in such a way that via wires 20a, 20b it can be detected that the entire edge is positioned against the ship side 12. Only then the high pressure cleaning liquid is supplied to cleaning head 2. In order to prevent cleaning head 2 from damaging a non-stick layer on ship side 12, bowl-shaped body 8 is provided with an edge 22 made of a soft plastic, over which a cover 23 made of cloth or felt is stretched in such a way that it can be replaced easily.

[0016] Fig. 3 represents a possible embodiment of a cleaning head 2 in a longitudinal section, with bowl-shaped body 8, provided with nozzles 9a,9b,9c,... and with a suction tube 13 which ends via an adapter part 14 in a slot 15 and via which the spray, produced by nozzles 9a,9b,... and the fouling which it has released is exhausted. Suction tube 13 is supported by a grip 16, which is made of plastic tubing and via which the high pressure cleaning liquid is passed to the nozzles. Nozzles 9a,9b,9c are mounted to strips 10a,10b,10c,...

which in turn are mounted slidable onto bowl-shaped body 8. In the plastic edge 22 of bowl-shaped body 8 a slot 24 is made which runs all round the bowl-shaped body and to which two tubes 25a,25b are connected via which an underpressure is realised in slot 24, which pulls cleaning head 2 onto ship side 12, as a result of which the operation of cleaning head 2 is substantially simplified. Tubes 25a,25b are combined to one tube 26, which is connected to pump unit 1 via hose 19 and which is connected there to a second vacuum pump.

[0017] Fig. 4 schematically represents a possible embodiment of a pump unit 1, provided with a vacuum pump 27 which generated the underpressure which is supplied to cleaning head 2 via hose 19. Moreover, pump unit 1 comprises a pump 28, which pumps the cleaning liquid under a high pressure to cleaning head 2, via tube 18 which for the greater part is included in hose 19. Pump 28 is steered by a control cabinet 29, which is connected to switches 21a,21b,... and which will switch on pump 28 only if all switches 21a,21b,... indicate that cleaning head 2 is pushed against the ship side. The liquid, which is recovered by vacuum pump 27, is fed to a supply vessel 31 via a coarse filter screen 30. Next, the cleaning liquid fed through a fine filter screen 32 and can be pumped again to cleaning head 2 by pump 28. In order to prevent fine filter screen 32 from becoming silted up, part of the cleaning liquid may be sprayed via nozzles 33a,33b against the inside of fine filter screen 32. In this process, nozzles 33a,33b are preferably continuously moved by a mechanism, obvious for the skilled man, such that continuously other parts of the fine filter screen 32 will be cleaned. Supply vessel 31 is provided with a removable lid, not shown here, via which the liquid can be replaced and the filter screens can be cleaned. Finally, pump unit 1 is provided with a second vacuum pump 34, which realises an underpressure in slot 24 in cleaning head 2 via tube 26.

#### Claims

1. System for cleaning a ship side, comprising a pump unit and a cleaning head, attached to the pump unit, which cleaning head can be moved alongside the ship side, **characterised in that** the pump unit is provided with pump means for pumping a cleaning liquid to the cleaning head and with suction means for returning cleaning liquid from the cleaning head to the pump unit.
2. System according to claim 1, **characterised in that** the pump unit is provided with filter means for filtering the returned cleaning liquid.
3. System according to claim 2, **characterised in that** the cleaning head comprises a bowl-shaped body, of which an open side is moved alongside the ship side under operational conditions.

4. System according to claim 3, **characterised in that** the bowl-shaped body is provided with a number of nozzles, for spraying the cleaning liquid.
5. System according to claim 4, **characterised in that** the bowl-shaped body is provided with brushes, mounted for rotation, which contact the ship side under operational conditions.
6. System according to claim 5, **characterised in that** the nozzles are positioned such as to make the brushes rotate under operational conditions.
7. System according to claim 3, **characterised in that** an edge of the bowl-shaped body is provided with at least one sensor device, connected to the pump means.
8. System according to claim 7, **characterised in that** a connection between the pump unit and the cleaning head consists of only one hose, through which the cleaning liquid supplied and drained away and through which signals from the sensor device are supplied to the pump unit.
9. System according to claim 4, **characterised in that** the bowl-shaped body is provided with a grip, which grip is also arranged as a manifold for distributing the cleaning liquid.
10. Pump unit or cleaning head which can be used as part of a system as claimed in one of the previous claims.

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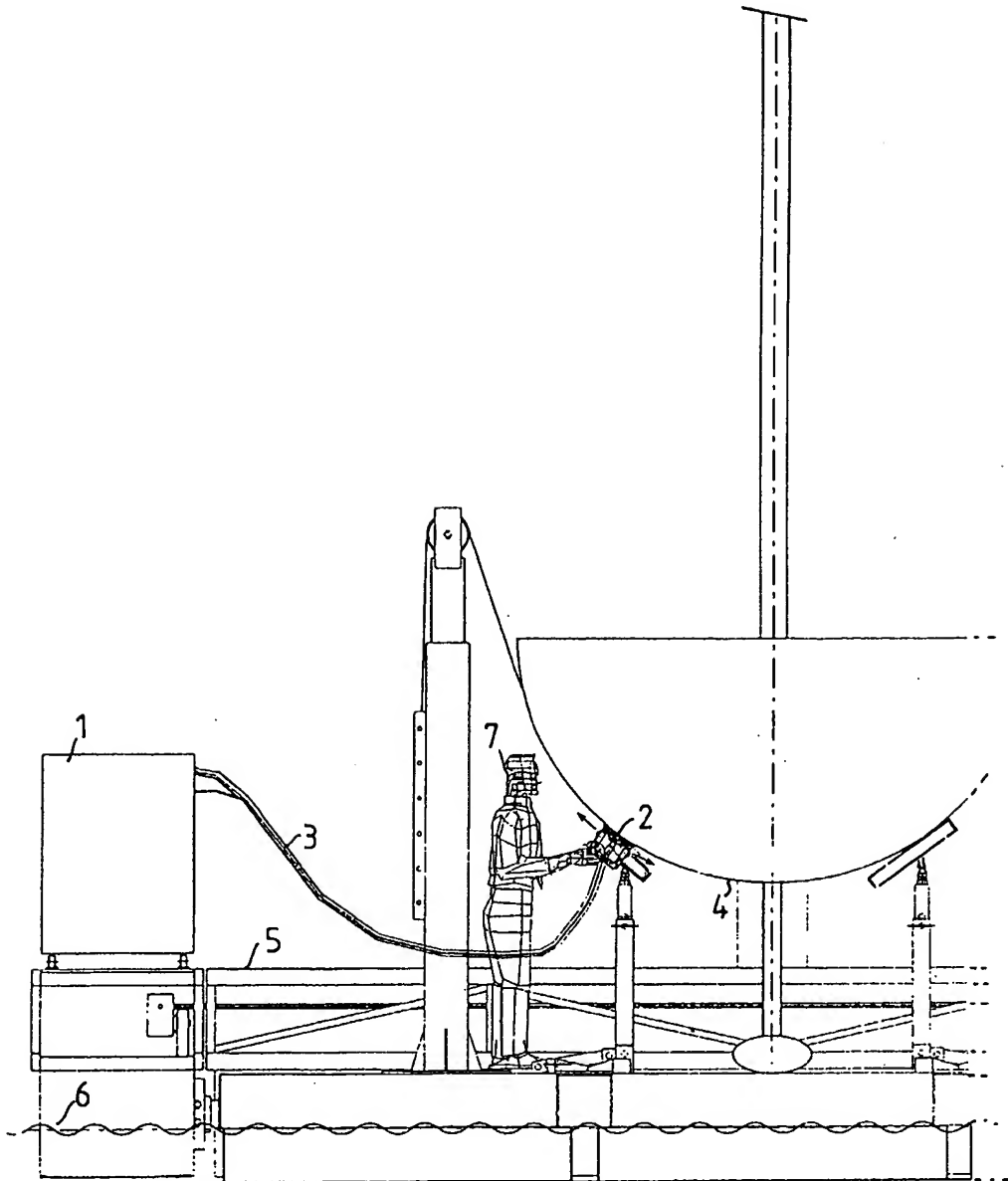
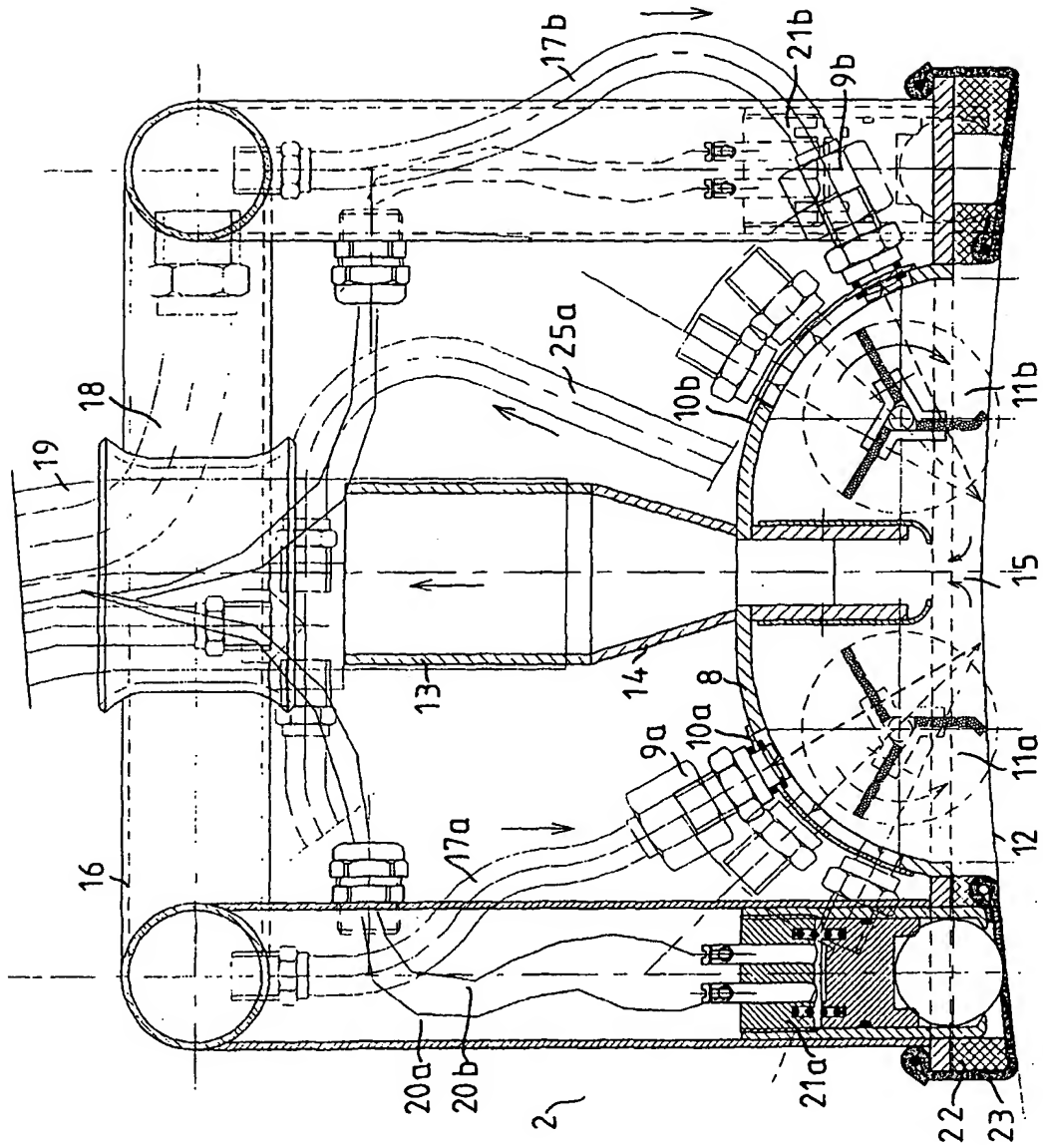
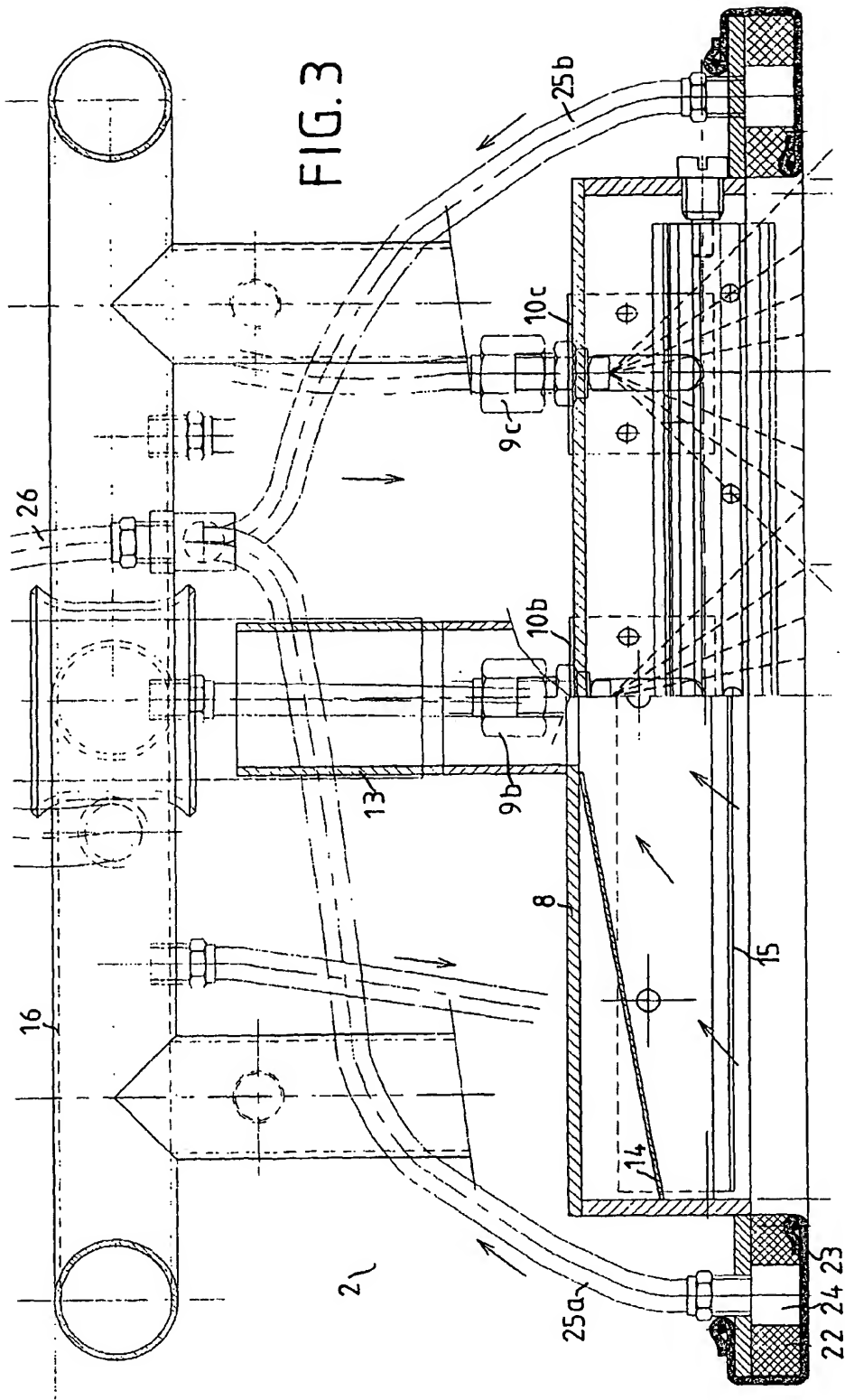


FIG.1

FIG. 2





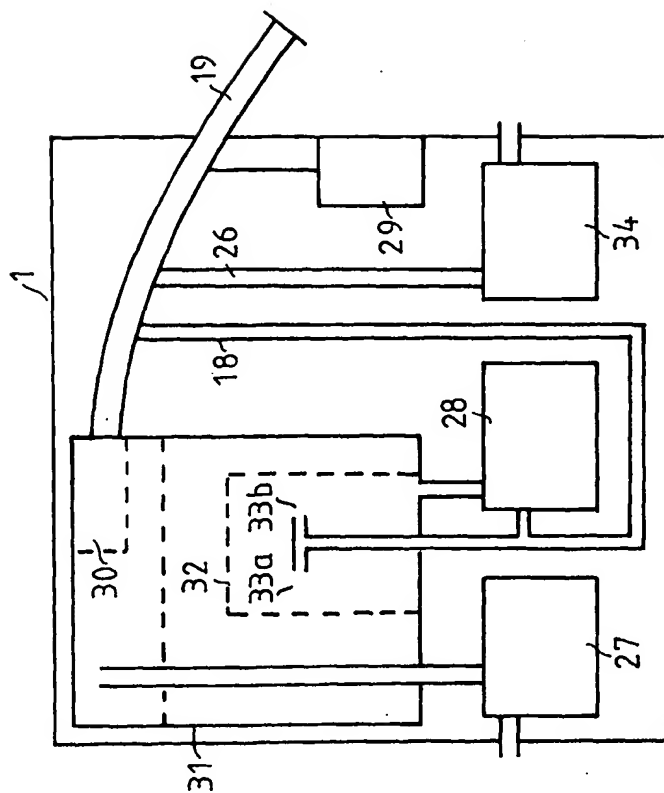


FIG. 4



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